ARGUMENTS/REMARKS

Favorable reconsideration of this application, as amended, is respectfully requested.

The abstract has been amended as required.

Fig. 10 has been amended as required, by designating the figure as "prior art".

A substitute specification is submitted herewith along with a copy showing revisions in the original specification. The substitute specification corrects the informalities noted in the objection to the disclosure and contains no new matter.

The claims have been amended, where appropriate, to overcome the claim objections, to overcome the rejection under 35 U.S.C. § 112, second paragraph, and to clarify the claimed invention. Independent Claims 1, 5, and 10 have been amended to clarify the manner in which the claimed invention distinguishes patentably from the prior art. However, as will appear more fully hereinafter, the prior art relied upon in the rejections under 35 U.S.C. §§ 102 and 103 has no relevance to Applicants' invention.

As stated in the BACKGROUND OF THE INVENTION, the present invention relates to a noise reduction technique in

an imaging system. As pointed out in the SUMMARY OF THE INVENTION, the present inventors investigated in detail the cause of noise appearing on a display image of an imaging system and found: 1) that noise generated at the time of outputting video data from an AD conversion LSI, in order to transmit the AD-converted video data to a digital signal processor (DSP), migrates into an imaging element such as a CCD via a power supply line, and thereafter appears on the video signal to be inputted to the AD conversion LSI, and 2) that such noise migrates into the input terminal side from the output circuit side through the power supply and semiconductor substrate within the AD conversion LSI. It appears that these noise problems are due to a large current that flows when an output signal is changed over.

The inventors discovered a very effective noise reduction technique that reduces a through-current in the output circuit resulting from the change-over of digital video data outputted from the AD conversion LSI. That technique involves encoding and code conversion. More particularly, after an analog color video signal outputted from an imaging element is AD-converted, a difference between codes of adjacent pixels is obtained in regard to the same color after the AD conversion, and an output code

of this difference is then converted into a code with less change-over bits between the adjacent codes. Through such code conversion, the number of bits changing when the output digital signal is changed over is lowered, so that a through-current in the output circuit is reduced and noise due to change of output is lowered.

Refer to Fig. 5 of Applicants' drawings and note the number of change-over bits for the present invention (row H) vis-a-vis the number of change-over bits for the existing system (row D).

The prior art relied upon in the rejections has no relevance to Applicants' invention.

Kondo '235 provides an imaging apparatus capable of producing a video signal of higher resolution without particularly increasing the number of pixels. The signal processor circuit 80 of Kondo performs common signal processing and matrix operations to yield the high resolution luminance signal Y and two high resolution color-difference signals R-Y and B-Y in a conventional manner having no bearing upon Applicants' invention.

Sasaki '698 employs matrix signal processing having no bearing upon Applicants' invention.

Abe '146 is concerned with reproducing gray levels of a document image. This has nothing to do with Applicants' use of gray code. Gray code, as is well known in the art, is a code defined by an ordering of 2^n binary numbers such that only one bit changes from one entry to the next. See, e.g., the gray code in Table 2 on pages 17-18 of Applicants' specification, and note that proceeding downward in the third column of the table only one bit changes from one entry to the next.

Turning now to the claims, independent Claim 1 recites inter alia, a differential means for obtaining a difference between codes of adjacent pixels in regard to the same color among preceding and succeeding digital signal pixel data, and a code conversion means for code conversion of an output of the differential means.

Independent Claim 5 recites, inter alia, a first semiconductor integrated circuit device including a differential means for obtaining a difference between codes of adjacent pixels in regard to the same color among preceding and succeeding digital signal pixel data, a first code conversion means for converting an output of the differential means, and a second semiconductor integrated circuit device for image processing including an image

processing circuit and a second code conversion means for converting codes outputted from the first semiconductor integrated circuit device.

Independent Claim 10, recites, inter alia, a signal conversion method wherein differential means produces a difference between codes of adjacent pixels in regard to the same color among preceding and succeeding digital signal pixel data, and an output code of the differential means is converted to a code of less number of bits to be changed over among preceding and succeeding codes.

The references relied upon in the rejections, whether considered individually or in combination, do not teach or suggest the inventions recited in the independent claims. More particularly, the differential means 80 of Kondo does not obtain a difference between codes of adjacent pixels in regard to the same color. Furthermore, the modulator circuit 81 and adder 82 of Kondo do not add or subtract a fixed value to or from an input code. The chroma signal and the luminance signal supplied to the adder 82 are not a fixed value. They vary in accordance with the video signal data.

The secondary references used in the rejections do not cure the deficiencies of Kondo.

Sasaki '698 is not concerned with a difference between codes of adjacent pixels in regard to the same color. Matrix signal processing may use a delay line, but there is no teaching or suggestion in Sasaki of the differential means recited in Claim 4, for example, in which the delay circuit is constructed to vary a delay time depending on the color arrangement of the input video signal.

Abe is not concerned with gray code.

Finally, there is no basis whatsoever for combining the teachings of the references relied upon in the rejections under 35 U.S.C. § 103 in any manner that would produce Applicants' claimed invention.

This application is believed to be clearly in condition for allowance.

The Commissioner is hereby authorized to charge to Deposit Account No. 50-1165 any fees under 37 C.F.R. §§ 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this

paper and has not been requested separately, such extension is hereby requested.

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

In an imaging system having a semiconductor integrated circuit device, noise problems due to a large through-current in an output circuit resulting from the change-over of digital video data outputted from an AD conversion LSI are reduced by a technique involving encoding and code conversion. After AD conversion of an analog color video signal from an imaging element, a difference between codes of adjacent pixels is obtained in regard to the same color, and an output code of this difference is converted into a code with less change-over bits between the adjacent codes.